

Test report No:
NIE: 65531RAN.002

Assessment report RF EXPOSURE REPORT ACCORDING TO ISED RSS-102 Issue 5:2015

(*) Identification of item under evaluation	Vaisala Beacon Edge Gateway EGW501
(*) Trademark	VAISALA
(*) Model and /or type reference	EGW501
(*) Other identification of the product	SW version: V0708_01.002.01.002 HW version: B FCC ID: 2AO39-EGW501 IC: 23830-EGW501
(*) Features	GSM, WCDMA, LTE
(*) Manufacturer	Vaisala Oyj Vanha Nurmijärventie 21, 01670 Vantaa FINLAND
Test method requested, standard	ISED RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager
Date of issue	2021-01-18
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Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested", "Other identification of the product", "Features", "Manufacturer" and "General description of the device").
2. Maximum antenna gain and use distance information.

DEKRA Testing and Certification, S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Identification of the client

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Document history

Report number	Date	Description
65531RAN.002	2021-01-18	First release

Appendix A: ISED RF Exposure assessment result

General description of the device under evaluation

The device under evaluation consists of a compact weather station for environmental monitoring. The complete solution provides measurements, data collection, and data visualization in one package. Vaisala Beacon Station includes Vaisala Beacon Edge Gateway EGW501, a multi parameter Vaisala Weather Transmitter WXT536, powering equipment, and mounting accessories. To maximize ease-of-use, the station comes with a data plan and a variety of service packages to choose from.

According to the manufacturer, during its normal use, the separation distance between the radiating structures of the device and nearby users will be greater than 20cm. In order to perform the assessment a conservative evaluation distance of 20 cm has been used.

As stated into DEKRA Testing and Certification, S.A.U. test reports num. 65531RRF.001, 65531RRF.002, 65531RRF.003, 65531RRF.004, the maximum measured output power levels for each supported technology are:

Technology / Mode	Band	Frequency (MHz)	Maximum Conducted Output Power RMS Burst (Incl. Tune-Up) (dBm)	Duty Cycle (%)	Time Averaged Conducted Power (dBm)	Antenna peak gain (dBi)	Maximum Averaged E.I.R.P. (dBm)	Maximum Averaged E.I.R.P. (mW)
GPRS 3TX	850	824 - 849	31.94	37.50	27.68	1.60	29.28	847.29
EGPRS 3TX	850	824 - 849	27.80	37.50	23.54	1.60	25.14	326.61
GPRS 3TX	1900	1850 - 1910	28.92	37.50	24.66	3.50	28.16	654.68
EGPRS 3TX	1900	1850 - 1910	27.80	37.50	23.54	3.50	27.04	505.86
UMTS	II	1850 - 1910	23.43	100.00	23.43	3.50	26.93	493.17
UMTS	V	824 - 849	23.14	100.00	23.14	1.60	24.74	297.85
LTE	2	1850 - 1910	23.52	100.00	23.52	3.50	27.02	503.50
LTE	4	1710 - 1755	23.89	100.00	23.89	3.50	27.39	548.28
LTE	5	824 - 849	22.56	100.00	22.56	1.60	24.16	260.62
LTE	12	699 - 716	23.75	100.00	23.75	0.40	24.15	260.02
LTE	13	777 - 787	22.64	100.00	22.64	0.40	23.04	201.37
LTE	26	814 - 849	23.01	100.00	23.01	1.60	24.61	289.07
LTE	41	2496 - 2690	22.53	100.00	22.53	2.10	24.63	290.40

Table 1: Equipment specifications

RF Exposure Assessment result and verdict

According to RSS-102 Issue 5, paragraph “2.5.2.Exemption Limits for Routine Evaluation – RF Exposure Evaluation”, each transmitting technology will be assessed against its exemption limits:

Technology / Mode	Band	Frequency (MHz)	Distance (cm)	Time-averaged maximum e.i.r.p (mW)	RF Exposure Exclusion Limit (mW)	Verdict
GSM/GPRS	850,00	824 - 849	20.00	847.29	1288.30	Pass
GSM/GPRS	1900,00	1850 - 1910	20.00	654.68	2239.01	Pass
UMTS	II	1850 - 1910	20.00	493.17	2239.01	Pass
UMTS	V	824 - 849	20.00	297.85	1288.30	Pass
LTE	2,00	1850 - 1910	20.00	503.50	2239.01	Pass
LTE	4,00	1710 - 1755	20.00	548.28	2121.78	Pass
LTE	5,00	824 - 849	20.00	260.62	1288.30	Pass
LTE	12,00	699 - 716	20.00	260.02	1151.30	Pass
LTE	13,00	777 - 787	20.00	201.37	1237.61	Pass
LTE	26,00	814 - 849	20.00	289.07	1277.59	Pass
LTE	41,00	2496 - 2690	20.00	290.40	2747.57	Pass

Table 2: Evaluation of the Exemption limits for Routine Evaluation

As maximum E.I.R.P. for each technology is below E.I.R.P limit for its applicable frequency, the device is exempt of RF Exposure evaluation.

Appendix B: ISED RF Exposure information

RF Exposure evaluation for mobile devices

According to RSS-102 Issue 5, Paragraph “2.5.2. Exemption Limits for Routine Evaluation – RF Exposure Evaluation”:

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device’s radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz⁶ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $22.48/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

According to RSS-102 Issue 5, Paragraph “4. Exposure Limits”, Industry of Canada has adopted the RF field strength limits established in Health Canada’s RF exposure guideline, Safety code 6:

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ $f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ $f^{0.25}$	0.1540/ $f^{0.25}$	8.944/ $f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 $f^{0.3417}$	0.008335 $f^{0.3417}$	0.02619 $f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ $f^{1.2}$
150000-300000	0.158 $f^{0.5}$	4.21 x 10 ⁻⁴ $f^{0.5}$	6.67 x 10 ⁻⁵ f	616000/ $f^{1.2}$

Note: f is frequency in MHz.
 *Based on nerve stimulation (NS).
 ** Based on specific absorption rate (SAR).

Table 6: RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²³	170	180	-	Instantaneous*
0.1-10	-	1.6/ f	-	6**
1.29-10	193/ $f^{0.5}$	-	-	6**
10-20	61.4	0.163	10	6
20-48	129.8/ $f^{0.25}$	0.3444/ $f^{0.25}$	44.72/ $f^{0.5}$	6
48-100	49.33	0.1309	6.455	6
100-6000	15.60 $f^{0.25}$	0.04138 $f^{0.25}$	0.6455 $f^{0.5}$	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	616000/ $f^{1.2}$
150000-300000	0.354 $f^{0.5}$	9.40 x 10 ⁻⁴ $f^{0.5}$	3.33 x 10 ⁻⁴ f	616000/ $f^{1.2}$

Note: f is frequency in MHz.
 *Based on nerve stimulation (NS).
 ** Based on specific absorption rate (SAR).

Evaluation Method

When device is exempt from RF Exposure evaluation because of E.I.R.P level according to “RSS-102 Issue 5, paragraph 2.5.2.Exemption Limits for Routine Evaluation – RF Exposure Evaluation”, to assess compliance with the Exemption Limits, maximum E.I.R.P was derived using the following formula:

$$P_{E.I.R.P.} = P_T + G_T - L_C$$

Where:

P_T = transmitter output power (including tune-up tolerance)

G_T = gain of the transmitting antenna

L_C = signal attenuation in the connecting cable between the transmitter and the antenna, if applicable

When RF Exposure evaluation is needed to determine compliance with RSS-102 Issue 5, RF Field Strength Limits, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst-case" or conservative prediction:

$$\text{Power density: } S[W/m^2] = \frac{P_{E.I.R.P.}[W]}{4\pi R[m]^2}$$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

$$P_{E.I.R.P.} = P_T + G_T - L_C$$

Where:

P_T = transmitter output power (including tune-up tolerance)

G_T = gain of the transmitting antenna

L_C = signal attenuation in the connecting cable between the transmitter and the antenna if applicable

Multiple frequencies assessment

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure towards the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^n \frac{S_i}{Lim_i}$$

Where

S_i is the applicable contribution of each source (e.g. power flux density).

Lim_i is the limit for the applicable contribution of each source (e.g. MPE power flux density basic restriction).